

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number  
**WO 2004/027369 A3**

- (51) International Patent Classification<sup>7</sup>: **G01M 3/04**
- (21) International Application Number:  
PCT/CA2003/001434
- (22) International Filing Date:  
19 September 2003 (19.09.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/411,786 19 September 2002 (19.09.2002) US
- (71) Applicant (*for all designated States except US*): NATIONAL RESEARCH COUNCIL OF CANADA [CA/CA]; 1200 Montreal Road, Building M-58, Room EG-12, Ottawa, Ontario K1A 0R6 (CA).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): HU, Cheng [CN/CA]; 5115 Chambers Street, Vancouver, British Columbia V5R 3L8 (CA). QU, Xidong [CN/CA]; 1102 - 9521 Cardston Court, Burnaby, British Columbia V3N 4R8 (CA). WU, Jonathan, Q., M. [CA/CA]; 8191 Hudson Street, Vancouver, British Columbia V6P 4M2 (CA). STANLEY, Kevin, G. [CA/CA]; 2343 Trafalgar Street, Vancouver, British Columbia V6K 3T1 (CA).
- (74) Agents: BAILEY, Thomas, W. et al.; Oyen Wiggs Green & Mutala, 480 - The Station, 601 West Cordova Street, Vancouver, British Columbia V6B 1G1 (CA).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:**  
— *with international search report*  
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*
- (88) Date of publication of the international search report:  
18 November 2004
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: METHOD AND APPARATUS FOR DETECTING AND LOCATING GAS LEAKS

(57) Abstract: The invention provides an apparatus and method for detecting the location of a gas leak within a test region. The invention comprises an array of calibrated sensors for measuring a plurality of gas concentrations, a control system coupled to the sensor array for calculating and optionally displaying a direction of higher gas concentration, and, an actuator for moving the sensor array under control of the control system, wherein the control system causes the array of sensors to measure the gas concentrations and move in the direction of higher concentration until a stopping condition is achieved. The stopping condition may be achieved when the measured gas concentration exceeds a predetermined threshold or when the concentration otherwise likely corresponds to the leak location based on a comparison with previously measured values.

WO 2004/027369 A3

# INTERNATIONAL SEARCH REPORT

International Application No

CA 03/01434

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G01M3/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	WO 03/012387 A (LATTICE INTELLECTUAL PROPERTY ; PRIDE RUSSELL DESMOND (GB)) 13 February 2003 (2003-02-13) page 1 - page 6	1-10, 16-20
Y	US 5 301 538 A (RECLA DENNIS) 12 April 1994 (1994-04-12) claims 1-11	1-10, 16
Y	US 6 157 033 A (CHUDNOVSKY BELLA HELMER) 5 December 2000 (2000-12-05) column 3 - column 6	1-10, 16-20
Y	US 5 214 412 A (GAVLAK MICHAEL A ET AL) 25 May 1993 (1993-05-25) column 2 - column 4	17-20
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

29 September 2004

Date of mailing of the international search report

06/10/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Dietrich, A

## INTERNATIONAL SEARCH REPORT

International Application No

/CA 03/01434

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 925 666 A (ALLAN COLIN J ET AL) 9 December 1975 (1975-12-09) column 2 - column 4 -----	17-25
A	WO 98/46376 A (SCIENCE & ENGINEERING ASSOCIAT) 22 October 1998 (1998-10-22) claims 1-24 -----	1-10
A	US 6 422 061 B1 (BOEHR CHRISTOPHER K ET AL) 23 July 2002 (2002-07-23) figures 13A-G, 14A-C, 19, 20 -----	1-10
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 04, 30 April 1996 (1996-04-30) & JP 07 333097 A (CHIYODA CORP), 22 December 1995 (1995-12-22) abstract -----	1, 16, 17
A	PATENT ABSTRACTS OF JAPAN vol. 0176, no. 19 (P-1644), 15 November 1993 (1993-11-15) & JP 05 196534 A (OSAKA GAS CO LTD), 6 August 1993 (1993-08-06) abstract -----	1, 16, 17

# INTERNATIONAL SEARCH REPORT

International Application No

/CA 03/01434

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 03012387	A	13-02-2003	EP 1415136 A2 WO 03012387 A2 GB 2382656 A	06-05-2004 13-02-2003 04-06-2003
US 5301538	A	12-04-1994	NONE	
US 6157033	A	05-12-2000	NONE	
US 5214412	A	25-05-1993	NONE	
US 3925666	A	09-12-1975	CA 1007325 A1 CA 987927 A2 CH 592934 A5 DE 2452685 A1 FR 2250990 A1 GB 1475910 A GB 1475909 A IT 1024818 B SE 7414236 A	22-03-1977 27-04-1976 15-11-1977 02-10-1975 06-06-1975 10-06-1977 10-06-1977 20-07-1978 15-05-1975
WO 9846376	A	22-10-1998	AU 7125998 A WO 9846376 A1	11-11-1998 22-10-1998
US 6422061	B1	23-07-2002	US 6085576 A AU 5621200 A CA 2375516 A1 EP 1194762 A2 JP 2003502661 T WO 0079243 A1 US 2002178789 A1 AU 756085 B2 AU 3105099 A AU 4970600 A CA 2325137 A1 CN 1301342 T EP 1171823 A2 EP 1064530 A2 JP 2003526768 T JP 2002538457 A NZ 507177 A WO 0052444 A2 WO 9947905 A2 US 2002124631 A1 US 6234006 B1 US 2004069046 A1 US 2001039824 A1 US 2001008816 A1 AU 1655101 A CA 2389708 A1 EP 1264251 A2 WO 0133212 A2 US 2003216869 A1 US 6606566 B1	11-07-2000 09-01-2001 28-12-2000 10-04-2002 21-01-2003 28-12-2000 05-12-2002 02-01-2003 11-10-1999 21-09-2000 23-09-1999 27-06-2001 16-01-2002 03-01-2001 09-09-2003 12-11-2002 26-09-2003 08-09-2000 23-09-1999 12-09-2002 22-05-2001 15-04-2004 15-11-2001 19-07-2001 14-05-2001 10-05-2001 11-12-2002 10-05-2001 20-11-2003 12-08-2003
JP 07333097	A	22-12-1995	NONE	
JP 05196534	A	06-08-1993	NONE	